

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4221-a
No. +++

Dibutyl Sulfide

This certified reference material (CRM) is produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This CRM is intended for use in the calibration of instruments, validation of analytical techniques and instruments during analysis of sulfur in fuel samples.

Certified Value

The certified value for sulfur of this CRM is given in the table below. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (k) of 2, which gives a level of confidence of approximately 95 %.

	Certified value Mass fraction (kg/kg)	Expanded uncertainty Mass fraction (kg/kg)
Sulfur	0.21919	0.00006

Analysis

The certified value of this CRM is sulfur in dibutyl sulfide. The certified value was determined from a purity of dibutyl sulfide, molecular weight, atomic weight of sulfur and sulfur in impurities in dibutyl sulfide. The purity of dibutyl sulfide was determined by the freezing point depression method and a mass balance method. The atomic weight and the molecular weight calculation were based on the IUPAC atomic weight table (2009).

Metrological Traceability

The certified value is determined from a purity of dibutyl sulfide, molecular weight, atomic weight of sulfur and sulfur in impurities in dibutyl sulfide. As the purity of dibutyl sulfide was determined by the primary method of measurement, freezing point depression method and the mass balance method, the certified value is traceable to the International System of Units (SI). The purity analysis by a mass balance method was conducted by gas chromatography with a flame ionization detector (GC-FID), gas chromatography with a sulfur chemiluminescence detector (GC-SCD) and Karl-Fisher titration (KF). Calibration curve method for the GC-FID and GC-SCD were performed by using solutions prepared gravimetrically with a JCSS-calibrated balance by NMIJ.

Indicative Value

The purity in the mass fraction of dibutyl sulfide is given in the table below. The uncertainty of the indicative value is the half-width of the expanded uncertainty interval calculated using a coverage factor (k) of 2, which gives a level of confidence of approximately 95 %.

	CAS No.	Indicative value, Mass fraction (kg/kg)	Expanded uncertainty Mass fraction (kg/kg)
Dibutyl Sulfide	544-40-1	0.9994	0.0002

Expiration of Certification

The certificate is valid for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

Sample Form

This CRM is in the form of a colorless and clear liquid at ambient temperature. This CRM of ca. 2 mL in net volume is kept in an amber glass ampule with argon gas.

Homogeneity

Ten ampules of 300 were sampled by stratified random sampling method in order of subdivision. These ten ampules were used for homogeneity tests by GC-FID and KF. Area percentages of dibutyl sulfide by GC-FID and water content by KF were measured and evaluated as homogeneity tests. The evaluated variation of purity between the ampules due to inhomogeneity was taken into account for the uncertainty of the certified value and this CRM is homogeneous within the range of the uncertainty of the certified value.

Instructions for Storage

This CRM should be stored at a temperature between 5 °C and 35 °C, and shielded from light.

Instructions for Use

This CRM is for laboratory use only. This CRM should be used promptly once the ampule is opened.

Precautions for Handling

Keep away from heat and ignition sources. Wear protective equipments such as safety glasses, safety mask and safety gloves in handling. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This CRM was purified and subdivided by Kanto Chemical Co., Inc. This CRM was purified by distillation. Two milliliters of dibutyl sulfide was filled into amber glass ampule in argon atmosphere.

NMIJ Analysts

Technical manager for this CRM is KATO K. The person responsible for production is KITAMAKI Y. Production analysts are KITAMAKI Y., SHIMIZU Y. and YOSHIMURA E.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customer. Customer registration on the NMIJ Website (given below) will facilitate notification. Technical reports regarding this CRM can be obtained from the contact details given below.

Reproduction of Certificate

In reproducing this certificate, it should be clearly indicated that the document is a copy.

April 1, 2020

ISHIMURA Kazuhiko
President

National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:
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Revision history

April 1, 2015: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."

November 22, 2016: The description in "Expiration of Certification" was changed to "one year from the date of shipment."

Sample